Cape Colony, acting under the advice of Hutcheon, is due the credit of proving that a preventive serum could be prepared capable of immunising sheep against this disease. Dr. Theiler informs me he has repeated Mr. Spreuill's experiments, and they hope to introduce this method of inoculation at an early date.

Heart-water of Cattle, Goats, and Sheep.

This disease was also first clearly described by Mr. Hutcheon. It occurs in the Transvaal, Natal, and Cape Colony, and is responsible for much of the yearly loss among the cattle, sheep, and goats.

Like the last disease—Blue Tongue—it resembles Horse-sickness in many ways, and, in fact, has been described by Dr. Edington as being identical with it. Like Horse-sickness, it is a blood disease with an invisible parasite, so that blood injected under the skin of susceptible animals gives rise to the disease. One difference between the parasites of the two diseases is, that whereas that of Horse-sickness is contained in the fluid of the blood, that of Heart-water is probably restricted to the red blood corpuscles. The serum separated from the blood is incapable of giving rise to the disease, and the straw-coloured pericardial fluid, when injected into susceptible animals, fails to give rise to any symptoms of the disease. Horse-sickness blood filtered through a porcelain filter is still infective; the opposite holds good up to the present with Heart-water. Horse-sickness blood can be kept for years without losing its virulence; Heart-water blood loses it in forty-eight hours.

Heart-water has a peculiar distribution, being restricted to the certain tracts of country with a warm, moist climate. It is known to farmers that if they remove their flocks to the high veld the disease dies out.

To Lounsbury is due the credit of explaining these facts. He found that the disease is carried from sick to healthy animals by means of the bont tick, *Amblyomma hebraeum*. This tick leaves its host between each moulting, and a larva which sucks the blood of an infected animal is capable of giving rise to the disease in a susceptible animal either as a nympha or imago. The distribution of this tick corresponds to the distribution of the disease. If this tick could be killed off, the disease would disappear from the country. This could doubtless be done on individual farms by long-continued dipping; but in the meantime some method of immunisation might be devised.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE next session at the South-Eastern Agricultural College, Wye, will commence on Monday, October 2, when an address will be given by Prof. Marshall Ward, F.R.S.

THE new session of King's College will be opened on October 3, when an address will be delivered by Prof. Clifford Allbutt, F.R.S., on "Medical Education in London." On October 4 an inaugural lecture will be given by Prof. Arthur Dendy on "The Study of Zoology."

THE inquiry into the general conditions of the home life of the Berlin brass-workers, their education and trade conditions, which the small party of Birmingham delegates carried out last April, is embodied in an interesting and entertaining manner in a report recently issued—"The Brass-workers of Berlin and of Birmingham," by Messrs. R. H. Best, W. J. Davies, and C. Perks (P. S. King and Son, price 1s.). The sensible inferences and criticisms contained in the report are ample evidences of close and accurate observation. The net practical conclusion of the inquiry seems to be that so long as the Birmingham brass-worker confines himself to the reproduction of a number of plain models, his work, especially his polished brass-work, is excellent, both in price and in finish; but "the Berlin training schools have produced a class of artisans with artistic talent, who find ready employment and are of great assistance to the employers. . . . A proper apprenticeship to his trade has fitted him (the Berlin brass-worker) and placed him in a position to supply the internal construction of intricate work without every minute detail being put down for him on paper. In the bronzing and treatment of the finish a greater freedom is apparent and a greater variety and novelty"; in fact, "they lead the way, we follow. . . ." The moral is obvious; indeed, in the further discussion of this point we find what is undoubtedly the most generally applicable and valuable criticism in the whole report:—"It is on the intellectual side that Birmingham requires to adapt itself to changed conditions: not to cheapening its wares but to getting more conception into them."

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 13.—"The Amplitude of the Minimum Audible Impulsive Sound." By Dr. P. E. **Shaw.**

In a previous paper (*Phil. Mag.*, December, 1900) the author found this quantity by direct measurement, and Rayleigh, Franke, Toepler, and Boltzmann have investigated the minimum audible for continuous sound. In each of the above researches the micrometer was not sensitive enough actually to measure the least audible amplitude; the relation of current to amplitude was determined for relatively large amplitudes, and separate measurements were made of the current which gives the least audible sound. Extrapolation then gives the amplitude in question.

The present paper shows how the amplitude can be measured directly without extrapolation; it is even possible, as shown in the tables, to measure movements the amplitude of which is too small to be audible. The instrument is the improved electric micrometer described at the Royal Society (see p. 495), which is capable of showing a movement of 0·4 $\mu\mu$.

There are two distinct parts in the determination:—(1) Observe the position of the diaphragm of a telephone when at rest, by making electric contact; draw away the measuring point of the micrometer and pass a steady current through the telephone so as to move the diaphragm to a new position of rest. Now move up the measuring point to the diaphragm, watching the micrometer screw and listening to the contact. Thus measure the movement of the diaphragm due to a set of steady currents down to such small ones as cause imperceptible motion. Plot the relation between movement and current.

(2) Apply the ear to the telephone and pass through it the same set of currents as before. For each current, except the smallest, a sound is heard when the current is stopped. We thus learn the relation of current to audibility.

The curve above at once gives the relation of amplitude to audibility. The sound is impulsive, for the diaphragm is released from a position of strain, vibrates under great damping, and soon comes to rest.

Both right and left ear of the author were used. He found, averaging results, 0·7 $\mu\mu$ as result for the right ear, and 0·9 $\mu\mu$ for the left.

The fundamental of the diaphragm when clamped hard to the case was found by testing it against tuning forks to have frequency about 580.

The following table of amplitudes is given:—

	A	B
Just audible	0·7 $\mu\mu$	0·14 $\mu\mu$
Just comfortably loud	50 $\mu\mu$	10 $\mu\mu$
Just uncomfortably loud ...	1000 $\mu\mu$	200 $\mu\mu$
Just overpowering ...	5000 $\mu\mu$ ...	1000 $\mu\mu$

The word "just" here implies in each case the lower limit. The amplitude of the diaphragm must not be confused with that of the air which it vibrates. Lord Rayleigh obtained the relation between these amplitudes to be roughly 5 to 1.

Column A gives numbers actually found in the telephone, and using Rayleigh's factor we obtain column B for the corresponding amplitude of the air.

It should be observed that 0·14 $\mu\mu$ is the smallest audible amplitude for an expectant ear when the conditions as to silence are exceptionally favourable; yet 10 $\mu\mu$ is the amplitude for the smallest audible sound in air, about which the ear can be quite sure when the conditions are normally favourable, and the ear not listening for the sound.

From the results found the author calculates the ampli-

tudes near the source of various great sounds, *e.g.* thunder, cannon firing, and volcanic explosions. He gives reasons for supposing that in rough terms these are not more than 1/12 mm., 1/4 mm., 1/200 mm. respectively. The volcanic sounds are carried to very great distances; but the sound source is very large in extent, and the amplitude at the source therefore may not be very great.

June 16.—"The Absorption Spectrum and Fluorescence of Mercury Vapour." By W. N. **Hartley,** F.R.S.

The author having undertaken the investigation of the absorption spectra of metals in a state of vapour, the first substance examined was mercury. It was volatilised in a flask of Heraeus's quartz glass, with a side tube to the neck from which the metal may be distilled and condensed. The rays from a condensed spark were passed through the flask and on to a cylindrical condensing lens of quartz which focused the rays on to the slit of a quartz spectrograph.

The Absorption Spectrum.—The whole rays were transmitted from the red to a point in the ultra-violet where there is a tin line at λ 2571·67. From there to λ 2526·8 there is a very sharply defined and intense absorption band, somewhat degraded on the side towards the red, beyond that the rays are transmitted with full intensity to a wavelength about 2000.

The Fluorescence.—When the mercury was boiling briskly the whole side of the flask nearest to the spark was lighted up with a green fluorescence; this penetrated about one-third of the space within the flask, and lighted up the interior. The quartz glass itself was not fluorescent in the slightest degree. Solutions of mercuric chloride showed no absorption band.

The absorption band in the vapour of mercury belongs to the vapour, and is accompanied by strong fluorescence between a certain maximum and minimum of temperature lying very near to the boiling point. It is a question still undecided whether the rays absorbed by mercury vapour, as shown by the band measured, reappear with a lowered refrangibility as yellowish-green light in accordance with the law of Stokes.

NEW SOUTH WALES.

Royal Society, June 7.—Mr. H. A. Lenehan, president, in the chair.—On the so-called gold-coated teeth in sheep: Prof. A. **Liversidge.** Paragraphs in some of the London and Sydney newspapers have stated that gold-coated teeth have been found in Australian sheep. The author recently received the lower half of a sheep's jawbone from Dubbo, the teeth of which are more or less completely incrusted with a yellow metallic substance, but more like iron pyrites (marcassite) or brass than gold. The deposit is about 1/32 of an inch, or less than 1 mm. in thickness. Under a half-inch objective it is seen to be made up of thin translucent layers, but there is no recognisable organic structure. The metallic lustre is due to the way in which the light is reflected from the surface of the superimposed films. The scale partly dissolves in dilute acids. The residue consists of filmy organic matter, still possessing a metallic sheen, although white in colour instead of yellow. The chemical examination shows that the incrustation on the teeth is merely a tartar-like deposit, made up principally of calcium phosphate and organic matter.

July 1.—Mr. H. A. Lenehan, president, in the chair.—Observations on the illustrations of the Banks and Solander plants: J. H. **Maiden.**

PARIS.

Academy of Sciences, September 4.—M. Troost in the chair.—Researches on the insoluble alkaline substances formed by humic substances of organic origin, and their *rôle* in plant physiology and in agriculture: M. **Berthelot.** The experiments were made with fresh and old specimens of humic acid prepared from sugar, with dead leaves, and with soil. The substances extracted by maceration with water and by distillation with water in presence of potassium and calcium salts were analysed.—The eclipse of the sun of August 30 observed at Paris: M. **Lœwy.** In spite of the interference caused by cloud, the partial eclipse was observed at Paris under good conditions. The times of first and second contacts were obtained, and numerous photographs were taken.—Actinometric measurements carried out during the eclipse of August 30: J. **Violle.** The observations at Trappes, Bordeaux, and on the Pic du Midi were spoilt by the weather, but satisfactory results, details of which will be communicated later, were obtained at Bagnères and Sfax.—On the existence in certain gooseberry trees of a compound furnishing hydrocyanic acid: L. **Guignard.** In the case of the common red gooseberry, hydrocyanic acid has been obtained from the leaves at all stages of their growth, but is absent from the fruit. The leaves of several other species have been examined for prussic acid with negative results.—On the glycuronic acid of the blood: R. **Lépine** and M. **Boulud.**—The secretary read telegrams from various observers relating to the solar eclipse of August 30, from which it would appear that satisfactory observations were obtained at Alcasebre, Sfax, Guelma, and Philippeville, clouds interfering at Cistierna, Burgos, Tortosa, and Alcalá de Chisbert.—Observation of the eclipse of August 30 at Alcalá de Chisbert (Spain): Marcel **Moye.** The brilliant corona was the most marked feature of the eclipse.—On the same: R. **Mailhat.** Remarks on some photographs taken at Paris.—On the envelopes of spheres of which the two sheets correspond with conservation of the angles: A. **Demoulin.**—On the importance of the effect of irradiation in spectrophotography: Adrien **Guébhard.**—The constitution of the copper aluminium alloys: Léon **Guillet.**—On the origin of lactose. The effects of injection of glucose into females during lactation: Ch. **Porcher.**—The geology of the southern Carpathians: G. M. **Murgoci.**—The influence of the solar eclipse of August 30 on the earth's magnetic field at Paris: Th. **Moureaux.** The oscillations observed during the eclipse were much greater than the regular diurnal variations.—On the polarisation of the sky during the eclipse of the sun: M. **Piltschikoff.**

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